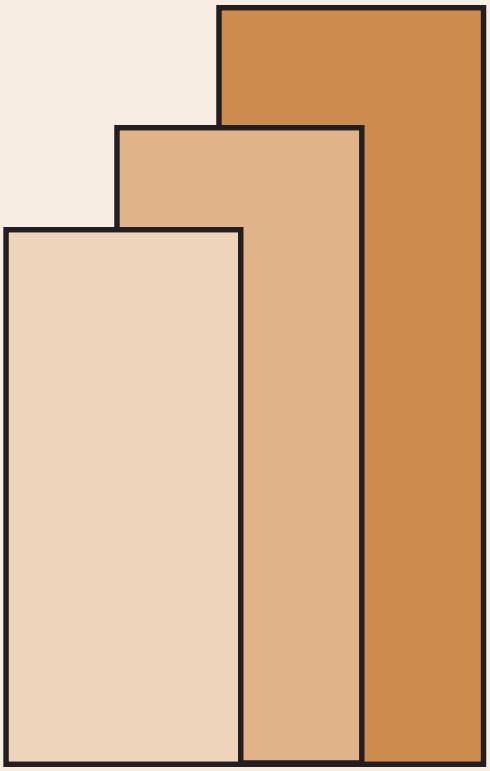
Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Agriculture, Rural Employment, and Inclusive Growth

Roehlano M. Briones

DISCUSSION PAPER SERIES NO. 2013-39



July 2013

For comments, suggestions or further inquiries please contact:
The Research Information Staff, Philippine Institute for Development Studies
5th Floor, NEDA sa Makati Building, 106 Amorsolo Street, Legaspi Village, Makati City, Philippines
Tel Nos: (63-2) 8942584 and 8935705; Fax No: (63-2) 8939589; E-mail: publications@pids.gov.ph
Or visit our website at http://www.pids.gov.ph

Agriculture, Rural Employment, and Inclusive Growth

Roehlano M. Briones[*]

ABSTRACT

This paper argues that the development of the rural economy is a key factor for achieving inclusive growth, one that *creates jobs, draws the majority into the economic and social mainstream, and continuously reduces mass poverty.* Employment conditions in Philippine rural labor markets and agriculture can be characterized as casual or informal, with low skill requirements, with low productivity and returns, and a greater concentration of poverty. This is consistent with a prominent strand of development literature that posits a traditional sector, mostly located in rural areas, and highly depending on agricultural livelihood. Development involves the change in economic structure, anchored on productivity growth in agriculture, involving a movement of labor from the traditional sector, as well as accelerated capital formation in industry and services.

Evidence, both international and for the Philippines, is favorable to the structural transformation perspective. For the Philippines in particular the evidence points to the following: agricultural growth causes nonagricultural growth, is tightly linked to downstream manufacturing, and it contributes significantly towards reducing poverty. Agricultural growth has a differential impact on employment of the unskilled labor, indirectly reduce economywide labor cost by keeping food affordable. Lastly, agricultural productivity growth can have long term dynamic effects by enabling farm households to invest in human capital, leading to intergenerational diversification of income sources.

The evidence suggests that the agricultural and rural economy should be at the forefront, rather than periphery, of the country's strategy for quality employment generation. Such a strategy completing an unfinished reform agenda for sustained development of the rural economy. This involves swift completion of the land reform program; post-2014, the state should focus on developing a flexible and responsive market for land rights. Liberalization initiatives should be pursued in the area of market policy and logistics. Government should rationalize its role as market regulator. Support for agricultural production should be oriented towards enhancing agricultural productivity, and comparative advantage based largely on the effective delivery of public goods and associated services such as R&D, irrigation, and other infrastructure. Agricultural development transcends productivity enhancement at the level of primary production, encompassing the agribusiness value chain and based on comparative advantage.

Keywords: agriculture, employment, labor market, inclusive growth, rural development

---

[*] Senior Research Fellow, Philippine Institute for Development Studies; rbriones@mail.pids.gov.ph. This originated from a background paper written for the Philippine Development Report 2012, a project of the World Bank. The author alone is responsible for the contents of this paper; no statement made here may be attributed to the PIDS, World Bank, or any other organization.

1. OVERVIEW

At the top of the agenda of the Philippine Development Plan is *inclusive growth*, meaning growth that is rapid, sustained, and wide enough to matter to a broad spectrum of the population. It "creates jobs, draws the majority into the economic and social mainstream, and continuously reduces mass poverty" (p. 14). The emphasis is understandable in the Philippine context: headcount poverty remains at 26.5% in 2009, down from 33.1% in 1991 – far off the target of 16.6% set under the Millennium Development Goals (Virola, 2011). Growth in per capita income tends to lag behind that of neighboring countries; in the 2000s, the country averaged a per capita growth of 3%, comparable to that of Thailand, but lower than Indonesia (4.3%), Vietnam (6.7%), and China (13.0%). Moreover, what little growth has occurred has not translated to lower poverty compared to other countries: whereas growth elasticity of poverty averages about 2.5 in developing countries, with a higher range observed (3.0 to 3.5) for neighboring countries (China, Indonesia, Thailand), growth elasticity is only 1.4 to 1.6 in the Philippines (Fuwa, Balisacan, and Bresciani, 2011). Furthermore, inequality has also stagnated at a Gini ratio in the range of 0.45 to 0.48 over the decade.

The Philippine Development Report 2012 aims to support the agenda of inclusive growth as well as making growth work the poor. It focuses on two areas not highlighted previously, namely the labor market and the rural sector. We argue that rural and agricultural employment is essential to understanding constraints to inclusive growth. The central thesis of the paper is as follows:

***The development of the rural economy is a key factor for achieving inclusive growth*.**

Unpacking this leads to three focal points:

i) Labor markets in rural areas;
ii) Agricultural activities (almost entirely located in rural areas);
iii) Nonagricultural activities in rural areas.

In developing countries, the rural population still accounts for the bulk of the poor, hence there is considerable potential to propel inclusive growth by generating rural employment. Agriculture continues to play an important role in the livelihoods of rural households. However agriculture alone cannot be the source of employment growth, as nonfarm activities account for a large if not the largest share of rural income and employment in many developing countries (Lanjouw and Lanjouw, 2001). We shall argue that inclusive growth requires *rapid agricultural growth* based on improvement in productivity, which then becomes the basis for *structural transformation*, i.e. the diversification out of agriculture, at the level of the rural economy (rural nonfarm growth) and for the economy as a whole (re-allocation towards manufacturing and services).

The importance of economic structure and its transformation is been a longstanding tradition in the development literature; however this tradition has been associated with *aggressive* state intervention to bring about the necessary structural changes. Such a stance fell into disfavor at the heyday of the Washington Consensus in the 1990s, when market reform became the paramount policy prescription. However, dissatisfaction with extremes of state and market organization, owing to failures in either extreme of state or market organization, has led to a rethinking of the structuralist approach.

The *new structuralist economics* (Lin, 2012) characterizes economic development in terms of

transition between various forms of economic structure. Each phase corresponds to patterns of *specialization* based on comparative advantage and factor endowments, as determined by a competitive market. Transition between phases is accomplished through "industrial upgrading"; such upgrading however confronts coordination problems. "Upgrading the industrial structure as well as the corresponding improvement in infrastructure, however, entails coordination of investments and compensation for externalities generated by first movers that cannot be internalized by private enterprises. (p.5)" The NSE affirms that the state can play this coordinating role.

This paper appropriates some key ideas from the new structuralist economics (NSE), while retaining an emphasis on agriculture as a lead sector in economic transformation. As Kruegger (2012) observes:

> However, in most countries rural labor could be absorbed only as agricultural productivity increased; Lin's NSE seems to equate growth with industrial expansion, ignoring the importance of increased productivity of the large fraction of the labor force (and of land) in rural areas. Failure to invest in agricultural research and development and in rural health and education has been a major weakness of many countries' development strategies. While strides have been made in reducing discrimination against agriculture, the NSE as exposited by Lin would appear to support the industrial and urban bias that has itself constituted a very large distortion in some countries (p. 49).

Our paper supports the "agriculture-led" view on structural transformation, based on agricultural productivity growth and human capital formation in rural areas.

The rest of this report is divided as follows: Section 2 presents some stylized facts on agriculture and rural employment in the Philippines. Section 3 review past studies linking agricultural and the rural economy to inclusive growth, together with some new evidence provided by this study. Section 4 sketches the elements of an employment strategy anchored on agriculture-led structural transformation. Section 5 concludes.

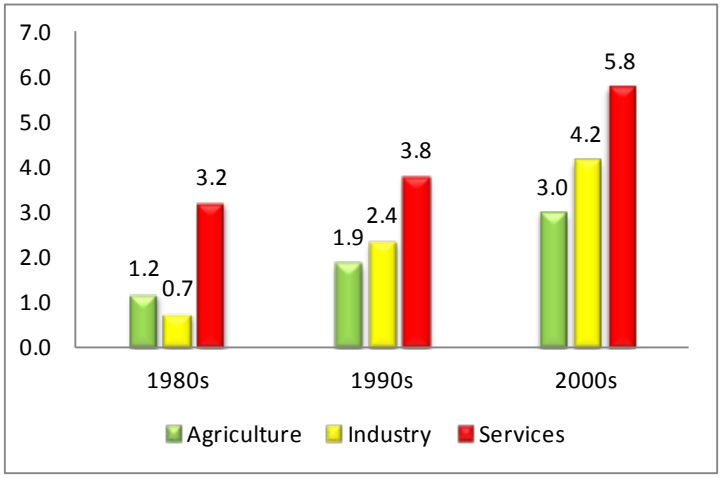
2. AGRICULTURE AND RURAL EMPLOYMENT IN THE PHILIPPINES

2.1. Patterns and trends in agriculture

Compared with industry and services, growth of agriculture has been weakest. *Aggregate output has been undergoing structural change; however the change in employment structure has been lagging.*

Agricultural growth was moribund throughout most of the 1980s and even the 1990s, with growth picking up only in the 2000s (Figure 1). Services grew fastest across the decades, whereas manufacturing outperformed agriculture in the past two decades. The disparities in growth rates implies structural change, i.e. the declining share of agriculture in output. From 1980 – 2010, the share of agriculture fell from one-fourth to just one-twelfth of GDP (Figure 2a). Services now contributes the biggest share in output, rising from 42 to 55% of GDP over the same period. The output share of manufacturing has stagnated at around one-third of GDP.

Figure 1: GDP growth by basic sector, decadal averages, 1980 – 2010

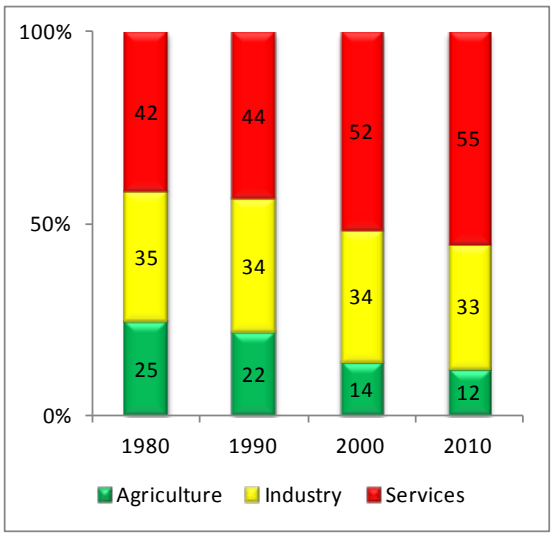


Source: NSCB.

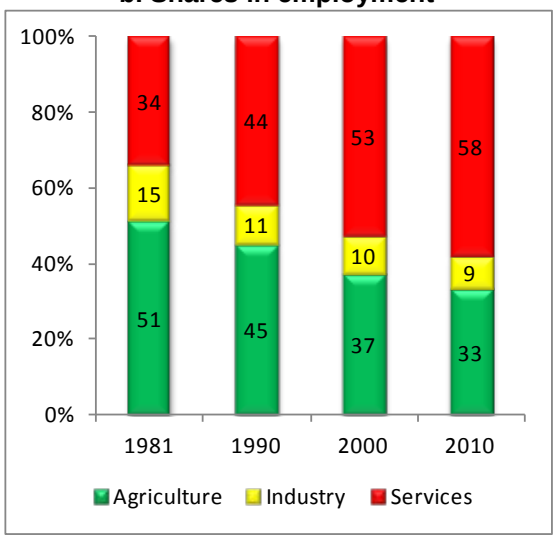
In 1981 agriculture was still contributing half of employment; by 2010 that share had fallen to a third (Figure 2b). This is far bigger than its one-twelfth output share. Employment share in manufacturing also dropped, perhaps more dramatically (compared to the base of 15%); hence, services has significantly raised its labor market share. Clearly the slower decline in employment share relative to output share implies a diminishing labor productivity (Figure 3).

Figure 2: Shares of basic sectors in GDP and employment, 1980 – 2010 (selected years, %)

a. Shares in GDP



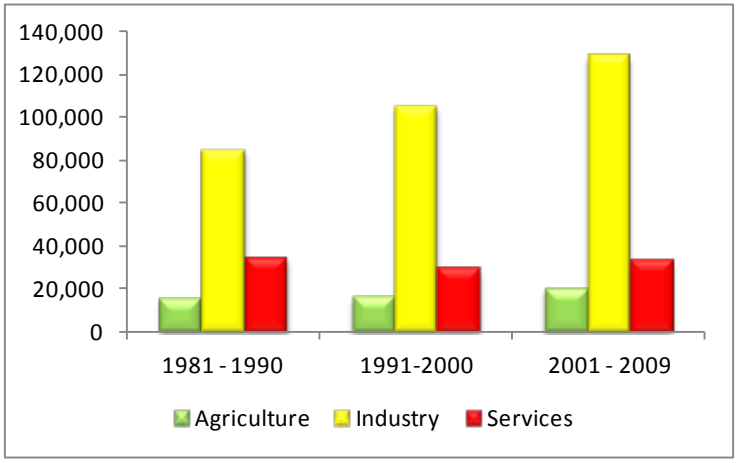
b. Shares in employment



Source: NSCB

Labor productivity in agriculture has been on the wane since the 1980s. Labor productivity is highest by far in industry, followed by services. Labor productivity of industry has been rising consistently, unlike for services, as the latter has taken the brunt of labor absorption from agriculture.

Figure 3: Labor productivity by sector, 1981 – 2010, in P '000 per worker (1985 prices)



Source of basic data: NSCB.

Across commodities, the leading sub-sectors during the high growth period (1970s) was coconut, banana, and poultry (Table 1). However the 1980s heralded a sharp slowdown across agricultural sub-sectors, particularly for traditional export crops, with the exception of livestock. Forestry continued its steep contraction throughout the 1990s. Banana, livestock, poultry, and fishery in particular, would recover in the 1990s, with growth acceleratingin the 2000s. The rebound of corn coincides with the shift from white (food) to yellow (feed) corn.

Table 1: Growth in agricultural gross value added by sub-sector, 1970 – 2010 (1985 prices, in %)

	1970s	1980s	1990s	2000s
Palay	4.2	2.6	3.9	2.5
Corn	5.2	3.5	0.1	3.9
Coconut	7.3	-4.6	0.6	1.9
Sugarcane	4.0	-1.6	3.9	0.5
Banana	13.8	-3.5	5.4	6.4
Other crops	8.9	1.5	1.1	1.2
Livestock	0.8	5.9	3.9	1.8
Poultry	10.5	6.5	5.5	3.0
Fishery	4.1	3.9	1.9	5.7
Forestry	-2.1	-7.8	-13.4	-1.0

Source: BAS and NSCB.

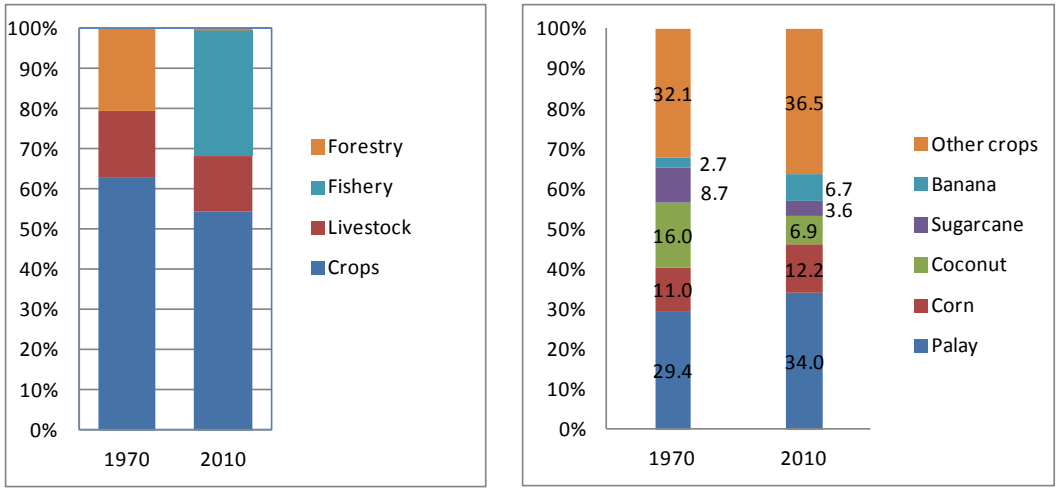
These growth rates suggest some degree of structural transformation within agriculture (Figure 4). The most noticeable adjustments are collapse of forestry share in gross value added, and the rapid expansion of fisheries; changes in share for livestock and poultry are minimal, whereas that of crops is noteworthy.

Among the crops, changes in sub-sectoral composition are remarkable only for banana, sugarcane, and coconut, i.e. expansion in value added share of the former, and contraction of the latter two commodities. There has been expansion of both rice and corn, the cereal

mainstays of Philippine agriculture; the share of assorted "Other crops" did increase, but at a disappointing pace.

Figure 4: Shares of sub-sectors in gross value added, 1980 – 2010 (selected years, 1985 prices, %)

In agriculture gross value added **In crop gross value added**



Source: BAS.

2.2. Trends and patterns in employment

Fields (2011) summarizes some of the salient features of developing country employment, as follows: compared to developed countries, developing countries have lower unemployment, a larger percentage of the workforce in agriculture, and a greater reliance on self-employment, own-account work, and unpaid family work. The better jobs are in wage employment, not self-employment. But within wage employment, the regular wage jobs are better than casual wage jobs. Labor markets are segmented, with limited access to regular wage employment. For the Philippines these stylized features are quite applicable:

Unemployment is low among workers with not more than primary schooling (Table 2).

Unemployment is relatively high (in the 7-8% range), but is concentrated among workers with tertiary and secondary schooling; while it is true that more educated workers tend to earn higher wages, they are also more likely to be out of a job. Unemployment is quite low among workers with not more than primary schooling. These workers are more willing to accept low-wage occupations in the informal sector. Meanwhile more educated workers may have a higher reservation wage, which are paid only in the formal sector; hence they are more willing to wait for vacancies in the formal economy.

Table 2: Unemployment rate by educational attainment of worker, 2006 – 2009 (%)

	2006	2007	2008	2009
No Grade Completed	2.8	2.6	2.1	2.0
Elementary	3.8	3.5	3.3	3.3
Undergraduate	3.3	3.2	3.1	3.0
Graduate	4.2	3.8	3.5	3.6
High School	9.4	8.7	8.6	8.6
Undergraduate	7.6	7.1	6.9	6.8
Graduate	10.4	9.5	9.4	9.5
College	11.2	10.1	10.6	10.7
Undergraduate	12.2	11.1	11.7	11.8
Graduate and Higher	10.3	9.2	9.5	9.6
Total	**8.0**	**7.3**	**7.4**	**7.5**

Source: BLES.

Nationally, the share of own-account workers rivals that of wage workers; in agriculture, most workers are own-account workers (Table 3)*.*

Wage and salary workers account for slightly more than half of total employment, but only about a quarter of agricultural employment . Meanwhile farmers are mostly self-employed (about 40% of agricultural workers); they may often utilize their family members (accounting for 26 – 27% of agricultural workers), or, less often, hire other wage workers as an employer (accounting for 7 – 8% of agricultural workers).

Table 3: Employment shares by type of worker, 2006 – 2009 (%)

	2006	2007	2008	2009
All Industries				
Wage and Salary Workers	51.1	52.2	52.4	53.3
Self-Employed	32.3	31.5	31.3	30.6
Employer	4.4	4.3	4.2	4.1
Unpaid Family Workers	12.3	12.1	12.2	12.0
Agriculture, Hunting and Forestry				
Wage and Salary Workers	24.5	25.6	25.8	26.6
Self-Employed	40.7	39.9	39.6	38.8
Employer	8.4	8.1	7.8	7.6
Unpaid Family Workers	26.4	26.4	26.7	27.0

Source: BLES.

Underemployment in the country is high, though underemployment rates tend to be lower for regions with large urban centers. Underemployment is concentrated in agriculture

Visible underemployment (working below 40 hours per week) is high; underemployment rates tend to be higher than unemployment rates (Table 4). The lowest underemployment rates are found in NCR, Region IV-A (mainland Southern Luzon), Region VII (Central Visayas), Region XI (Davao Region), and ARMM. The abovementioned regions host the main urban centers, i.e. Metro Manila, Cebu, and Davao City, and tend to have low shares of agriculture in GDP. Among the sectors, agriculture accounts for most of the underemployed (Table 5).

Labor demand in agriculture tends to be more intensive in unskilled labor.

Not only is agriculture the locus of underemployment - agricultural workers tend to be less skilled. In Table 6 Here we adopt two definitions of unskilled: Definition I adopts the more stringent definition of "skilled worker" as one who has completed secondary schooling; Definition II adopts the looser definition as one who has completed primary schooling. Going by either definition, the share of unskilled labor is always higher for agriculture compared to non-agriculture, across all regions. The reliance on unskilled labor (under either definition) is greater for the poorer regions, i.e. Bicol, Central and Eastern Visayas, and the Mindanao regions (except Central Mindanao), for which the share of agriculture in total output tends to be higher than the national average.

Table 4: Regional shares in GDP and total underemployment, 2006 - 2009 (%)

REGION	Share of agriculture in GDP, 2009	Share of visibly underemployed in total workers			
		2006	2007	2008	2009
Philippines	14.8	13.9	12.0	11.8	11.8
NCR	0.0	6.6	4.9	4.3	4.3
CAR	12.1	10.0	7.1	8.7	7.7
Region I	31.4	14.0	11.3	11.3	10.9
Region II	42.0	17.7	11.4	12.6	10.6
Region III	19.8	8.3	6.0	5.3	4.9
Region IV-A	19.0	10.9	8.8	8.8	10.0
Region IV-B	38.0	16.5	17.6	19.2	18.9
Region V	17.2	25.4	23.9	23.4	22.7
Region VI	18.5	18.0	17.2	17.0	18.5
Region VII	8.8	10.3	9.2	8.3	8.5
Region VIII	29.3	20.5	17.6	18.0	17.3
Region IX	39.7	17.8	15.8	14.4	16.0
Region X	28.9	20.5	18.0	15.6	16.7
Region XI	22.2	14.5	11.7	11.7	12.2
Region XII	38.7	17.2	15.4	15.4	12.9
Caraga	28.7	15.6	14.8	16.6	17.1
ARMM	51.4	9.9	13.4	11.8	9.5

Source: BLES.

Table 5: Distribution of underemployed workers, by sector, 2006 – 2009 (%)

Industry	2006	2007	2008	2009
All industries	100.0	100.0	100.0	100.0
Agriculture, Hunting, and Forestry	48.7	50.6	51.9	49.3
Fishing	7.3	7.3	7.1	7.8
Other industries	44.0	42.1	41.0	42.9

Source: BLES.

The bulk of poor households are dependent on agriculture; such households tend to be chronically poor.

Reyes et al (2011) provide poverty estimates that distinguishes chronic and transient poverty by sector of occupation of the household head (Table 7). Estimates are based on the 2003 and 2006 rounds of the Family Income and Expenditure Survey (FIES). In their study a household is under chronic poverty if it is poor in both 2003 and 2006, and is under transient poverty if it is poor only in 2006 (and not poor in 2003). In 2006, 40 percent of agricultural households were poor, compared to 19 percent of non-agricultural households. For the former, about 70 percent of the poor are classified as under chronic poverty, compared to just 19 percent for non-agricultural households. Meanwhile of the total poor households, 74% are in agriculture; of the chronically poor, 77% are in agriculture.

Table 6: Shares of sectoral employment by skill category, average of 2001 – 2009 (%)

	Definition 1 (Secondary school completion)				Definition 2 (Primary school completion)			
	Agriculture		**Nonagriculture**		**Agriculture**		**Nonagriculture**	
Region	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled
CAR	26.1	73.9	74.5	25.5	43.5	56.5	84.0	16.0
Ilocos	42.8	57.2	71.4	28.6	56.7	43.3	81.2	18.8
Cagayan Valley	27.1	72.9	64.6	35.4	44.3	55.7	77.1	22.9
Central Luzon	32.5	67.5	63.8	36.2	46.4	53.6	75.6	24.4
Southern Tagalog	25.1	74.9	66.5	33.5	40.0	60.0	78.2	21.8
Bicol	19.9	80.1	52.6	47.4	35.5	64.5	67.4	32.6
Western Visayas	23.3	76.7	61.0	39.0	38.5	61.5	75.1	24.9
Central Visayas	12.8	87.2	54.2	45.8	24.1	75.9	68.9	31.1
Eastern Visayas	13.8	86.2	48.2	51.8	28.0	72.0	64.7	35.3
Western Mindanao	14.0	86.0	55.2	44.8	28.5	71.5	71.3	28.7
Northern Mindanao	19.6	80.4	60.7	39.3	36.7	63.3	77.2	22.8
Davao Region	19.9	80.1	58.4	41.6	36.0	64.0	74.9	25.1
SOCCSKSARGEN	24.4	75.6	60.7	39.3	43.7	56.3	76.0	24.0
Caraga	17.5	82.5	55.9	44.1	35.2	64.8	73.6	26.4
ARMM	17.3	82.7	54.0	46.0	30.7	69.3	66.6	33.4

Source: Author's calculations based on LFS data.

Table 7: Profile of poor households by temporal poverty and occupation, Philippines, 2009

	Occupation of household head	
	Agriculture	Non-agriculture
Percentage of sample households		
All poor households	39.9	18.7
Under chronic poverty	27.6	10.8
Under transient poverty	12.3	7.8
Percentage of poor households		
All poor households	73.8	26.2
Under chronic poverty	77.1	22.9
Under transient poverty	67.4	32.6

Note: Sample is drawn from matched panel of the 2003 and 2006 FIES (unweighted).
Source: Reyes et al (2011).

In short, employment conditions in rural labor markets and agricultural sector are mostly casual or informal, with low skill requirements, with low productivity and returns, and a greater concentration of poverty. Implications of these facts and patterns for growth and reduction of poverty are discussed in the next section.

3. INCLUSIVE GROWTH AND AGRICULTURE: EXPLANATIONS AND EMPIRICS

3.1. Models

Neoclassical vs. dual economy models*.* The standard neoclassical model of a unitary labor market predicts an equilibrium wage equal to the value of marginal product. With minor qualifications, any observed differences in wages is attributed to differences in labor quality leading to differences in marginal product. Labor quality may differ owing to personal ability or endowment of human capital, built up primarily through schooling; this underlies the human capital model of Mincer (1958).

In contrast, Lewis (1954) proposed a *dual economy* model that distinguishes between a traditional and modern sector. The modern sector may be characterized as neoclassical. However, employment in the traditional sector is characterized by *surplus labor* in which marginal product of labor is zero, i.e. workers can be taken out the traditional sector with no loss in output. Wages do not fall to zero (the marginal product of labor), but remain at some subsistence level; the reason is that in the traditional sector, wage-setting and other economic outcomes are determined not by commercial relations, but rather by institutional arrangements and norms.

Economic growth hinges on savings mobilization and capital accumulation in the modern sector, driven by the movement of labor out of the low-productivity traditional sector into the high productivity modern sector. Elimination of surplus labor leads to a unitary labor market where workers are paid their marginal products, which are now equalized between sectors.

The representation of the labor market may vary in detail across dual economy models; their common feature is that a factor market imperfection places a wedge between wages in the modern sector and the wages and opportunity cost of labor in the traditional sector. The phenomenon of surplus labor seems consistent with patterns of Philippine underemployment discussed in Section 2, as well as international evidence reviewed in Briones (2006).

According to Lewis, disguised unemployment can be observed in both rural and urban settings. Later authors tended to associate the traditional sector with agriculture and the modern sector with industry. The resulting strategy favored *unbalanced growth* anchored on industrialization. On the contrary, Ranis and Fei (1961) presented a dual economy model to advocate for *balanced growth* of industry and agriculture. They noted that agriculture is both a venue for employment of surplus labor, as well as source of food for workers in manufacturing. They showed that rural and urban wages tend to be stable during the phase of surplus labor; growth based on re-allocation from agriculture to industry can be prolonged by raising agricultural productivity. Eventually however surplus labor would be exhausted, leading to rising wages - a transition they termed the “Lucas turning point”.

Multi-sectoral growth models. The celebrated neoclassical growth model of Solow concludes that growth in long run per capita income can e reduced to technological progress. The basic model was extended by making savings endogenous, i.e. optimal growth models; a further

extension was to make technological progress endogenous, i.e. endogenous growth models. However the mechanics of development are based a standard one-sector macro-model. Such models however may gloss over the contribution of structural change to economic development. Analyzing such a process requires multi-sectoral models.

Jorgenson (1967) pioneered the neoclassical growth model with dual development between agriculture and industry. The distinctions between the two sectors is that agriculture has a prior claim on labor; however capital accumulation occurs only in industry, in accordance with a fixed savings rate from industrial output. Labor becomes available to industry only after a critical minimum amount of per capita food production is reached, i.e. only in the presence of agricultural surplus. Once this surplus is generated, Jorgenson showed that economic growth proceeds in a sustained fashion. According to this model, the presence and re-allocation of surplus labor is not essential for structural transformation; nor is agriculture an “engine of growth” except in the initial stage of transition to agricultural surplus.

The multiple functions of agriculture (i.e. as source of labor and food, among others) has been used to elaborate a more positive view of the role of agriculture in development (Johnston and Mellor, 1961). A recent example is Gollin, Parente, and Rogerson (2002). It follows the basic neoclassical dual economy model; in particular, industrial output can be invested or consumed, but agricultural output can only be consumed. Furthermore, the model distinguishes between traditional and modern technology in agriculture. The former is the default technology but only the latter is subject to exogenous technical progress. Agricultural technology is traditional until a minimum level of per capita output is reached, after which agriculture switches to modern technology. Productivity improvement in agriculture becomes an indirect engine of growth as it releases labor to the sector which is the venue for capital accumulation, i.e. industry.

Dual development and the rural-urban dichotomy. Industry (the sector of capital accumulation) has often been associated with urban centers; hence, re-allocation of labor from agriculture to industry entails rural-urban migration. However, the transition from rural to urban employment may not be as automatic as assumed in the foregoing multi-sectoral models, according to Harris and Todaro (1970). Their model posits an urban wage that is institutionally fixed, whereas rural labor is paid under competitive wages at its marginal product. Workers migrate until the expected wage is equalized between urban and rural areas, which is consistent with some unemployment in the former. Paradoxically, an increase in the number of urban jobs raises urban unemployment owing to the induced migration effect. Hence, the re-allocation of labor from rural to urban areas fails to achieve structural transformation if the modern sector is also riddled with distortions that constrain employment growth. Similar results can be obtained even with the introduction of an urban informal sector with inferior conditions of employment compared to the urban formal sector, e.g. Rauch (1993).

Dual development between urban and rural areas has been related to poverty and inequality through the mechanism of migration and human capital investment, coupled with incomplete financial markets (Masson, 2001). An overlapping generations model is developed a an economy producing a rural agricultural good, an urban manufacture, and urban informal sector output. The wage in urban manufacture remains above the marginal product, due to institutional distortion or efficiency wages. Wages in other sectors are set competitively.

Labor is distinguished as skilled and unskilled. The rural good is produced using unskilled labor, while urban manufactures is produced using skilled labor and capital. Acquisition of skill entails a discrete investment in human capital. The cost of the investment varies by innate ability, and

can only be financed by bequest. Workers in rural areas who are more able and/or with sufficient bequests, are able to make the human capital investment and migrate to urban areas. If employed in the formal sector, they receive the high urban formal wage; otherwise they earn the urban informal wage, together with urban unskilled workers. Clearly, initial wealth distribution determines the future dynamics of asset inequality. A significant subset of rural households end up in the lowest income category, unable invest in skill acquisition; likewise a significant subset of urban workers end up in lower income jobs in the informal sector.

The urban employment problem has motivated analysis of the potential for agriculture to serve as an engine of employment, through linkages involving both production channels (i.e. forward to agro-processing, or backward to agricultural inputs) and consumption channels, from farm income to consumer goods industries. Both consumption and production linkages are the basis of numerous "multiplier" estimates; for Asia these estimates range from 1.6 to 1.8 (Haggblade, Hazell, and Dorosh, 2007). The rural development literature has also drawn attention to the nonfarm economy and employment in rural areas. A review by Davis et al (2009) find that, outside Africa, nonagricultural incomes account for 40-60% of rural incomes. Admittedly, the sheer diversity of activities in the rural nonfarm economy limit generalizations about the income potential of rural nonfarm activities. Nonetheless, evidence suggests that in regions with dynamic agricultural economies, farm productivity growth has propelled subsequent growth of employment in more remunerative rural nonfarm activities, particularly in services (Haggblade, Hazell, and Reardon, 2010).

3.2. Evidence at the cross-country level

We now review the evidence that would tend to confirm the importance of structural change, especially for inclusive growth. One strand of the literature attempts to link structural change to economic growth or growth in total factor productivity (TFP), given that variations in TFP the more important source of variations in per capita incomes, compared to differences in factor endowments (Hall and Jones, 1999). Temple and Wossman (2008) show that structural change variables account for a significant part of TFP growth. Country-level TFP was decomposed by Chanda and Dalgaard (2008) into a component related to absolute productivity differences, and a component related to the relative labor productivity of agriculture; ultimately the importance of the latter is attributed to a factor market distortion (as in standard dualism theory). They find that as much as 85% of differences in TFP is accounted for by the relative productivity component. Likewise, Vollrath (2009) traces differences in per capita incomes across countries to differences in the labor productivity between agriculture and nonagriculture, where labor is measured in efficiency units (i.e. adjusted for human capital). He finds that factor market efficiency accounts for 30 to 40% of the variation in income per capita, and nearly 80% of variation in TFP.

Other studies focus more explicitly on growth linkages across sectors. Timmer (2002) finds a positive relationship between agricultural growth and per capita income in a country-level panel. His method though may be prone to an endogeneity problem. This is addressed in Bravo-Ortega and Lederman (2005), which applies Granger causality analysis by regressing nonagricultural GDP of a multi-country panel against one-year lagged agricultural GDP (in logarithms) and a vector of controls. They confirm that agricultural GDP growth causes nonagricultural GDP growth. The elasticity of nonagricultural to agricultural GDP is 0.12 for Latin America and the Caribbean (LAC) countries, rising to 0.15 for other developing countries. Similarly, Tiffin and Irz (2006) find that growth in agriculture value added per worker Granger-causes growth in GDP per capita.

Dualism has also been linked to income inequality by Bourguignon and Morrison (1998). Their cross-country regression showed that the effect of relative labor productivity (the ratio of average product of labor in agriculture to that of the rest of the economy) on income inequality is substantial; a change in relative labor productivity by one standard deviation increases the income share of the bottom 60% of the distribution by 1 percentage point and reduces that of the top 20% by more than 2 percentage points.

The role of sectoral composition of growth on poverty at the national level was explored by Loayza and Raddatz (2010). They find that share-weighted sectoral growth (under suitable disaggregation) has varying effect on headcount poverty. They explain this by positing a linear relationship between wage growth and poverty reduction. Under fairly standard assumptions, wage growth is decomposable to share-weighted sectoral (per capita) growth plus a sector-specific premium, which depends on labor intensity. They then fit a regression model in which change in poverty is affected by sectoral growth with an adjustment term accounting for variations in labor intensity. The coefficient of the adjusted term is statistically significant and of much greater magnitude than unadjusted sectoral growth. Additional runs suggest that agriculture's contribution to poverty reduction is largely explained by its intensive use of unskilled labor. While Loayza and Raddatz (2010) claim an alternative to factor market dualism, we may alternatively interpret their results as reinforcing the dual economy explanation for poverty and inequality, with unequal access to skill acquisition being a major transmission channel a lá Masson (2001).

3.3. Sub-national analysis: reduced form estimates

The preceding studies are all conducted in terms of country-level comparisons. At the sub-national the issue of inclusive growth in relation to agriculture and rural development was explored by Ravallion and Datt (1996) for India as well as Ravallion and Chen (2007) for China. The main regression equation in these studies involves a poverty measure as a dependent variable, with share-weighted per capita income by sector as dependent variables. Applying this to a state panel for India, the first study finds that both agriculture and services growth had equivalent impacts on poverty reduction. Meanwhile for provincial panel in China, the second study finds that the bulk of poverty reduction occurred in rural areas; growth in the primary sector had four times the impact on poverty than growth in secondary or tertiary sectors.

Suryahadi et al (2009) apply a similar regression model on a panel of Indonesian provinces. For Indonesia, in 1984 (the initial period of the data), agriculture accounts for 66% of the total poor, and 73% of rural poverty. They also distinguish production sector by location (i.e. urban agriculture, rural agriculture, etc.); lastly the dependent variable (change in poverty by province) is differentiated by location (urban and rural) as well as sector (agriculture, industry, services). They find that urban poverty responds best to growth in urban services, with small effects from growth of rural sectors. On the other hand, rural poverty responds strongest to growth in rural agriculture, rural services, and urban services (the last possibly channeled through remittances).

The Philippine case has been studied by Fuwa, Balisacan, and Bresciani (2011a). They use a provincial panel of the Philippines for 1991-2006 drawn from the FIES. As GDP data is unavailable at the provincial level, they measure provincial output using aggregate real household income. The sector indicator for agriculture is agricultural income per ha; the sector indicator for non-agriculture is real non-agricultural income per capita. They obtain the following:

- Elasticity of poverty to sectoral productivity is negative, statistically significant, for both agricultural and nonagricultural sectors, though the latter is larger;

- The impact of agricultural productivity is significantly higher when interacted with agriculture potential, proxied by percent of land area that has potential for irrigation (i.e. below 3% slope);

- Elasticity of poverty to agriculture is lower for areas with better road infrastructure – a proxy of integration of households to markets.

These results suggest development of agriculture would have a bigger impact on poverty if focused on areas which are suitable for agriculture but where transport infrastructure is underdeveloped.

3.4. Transmission channels: output linkages

To account for the impact of agricultural growth on poverty, a likely transmission channel is through income or output; that is, agricultural and nonagricultural production are related a lá Bravo-Ortega and Lederman (2005). We apply their analysis to sub-national level by regressing a measure of nonagricultural output growth against a lagged values of itself and a measure of agricultural output growth. The data set consists of annual data from the NSCB for 1978 – 2009, the complete span of years for which regional output information is available. Details of the estimation are shown in the Annex. The results of the estimation are as follows:

Agricultural output does have a positive and statistically significant effect on nonagricultural output.

The effect is however somewhat small: a one percentage point increase in agricultural output growth translates to an average of 0.04 percentage point increase in nonagricultural output growth. This should not be surprising given that agricultural output is only about one-fifth the size of nonagricultural output (based on 1985 prices). Hence a one percent growth in agricultural output, translated in peso terms, is a small proportion of value added in nonagricultural output. Nevertheless the positive growth linkages are present and should be taken into account in formulating sector development strategies.

Inter-industry linkages*.* One way to account for these linkages is through inter-industry flows. The small share of agriculture in output may underestimate its true economic contribution via forward and backward linkages. Tolentino et al (2001) estimate that 40% percent of GDP and two-thirds of the labor force are found in agriculture, agro-processing, and supply of agricultural inputs. Balisacan et al (2011b) estimate agribusiness at about 15% of GDP as of 2009; added to the agriculture share, their estimate of agriculture and agribusiness is about 32% of GDP.

Comprehensive documentation of inter-industry flows is available from the input-output (I-O) table, of which the most recent is for 2000 (NSCB, 2006). The degree to which agriculture contributes to other sectors of the economy may be more precisely captured by *technical coefficient* of agriculture, and the *coefficient of forward linkages*, which we compute from the 11-sector table (Table 8). The former measures the cost contribution (in pesos) of agriculture per peso of gross output; the latter measures the increment, in pesos per peso expansion of gross output (distributed according to shares in value added by sector). Finally we include an "index of sensitivity" of forward linkages based on the formula of NSCB (2006).

Table 8: Measures of production linkage of agriculture

Sector	Technical coefficient of agriculture	Coefficient of forward linkages	Sensitivity of forward linkages
Agriculture	0.073	0.37	1.03
Mining	0.001	0.46	0.82
Manufacturing	0.111	0.56	2.88
Construction	0.000	0.05	0.63
Electricity, Gas, and Water	0.000	0.23	0.82
Transportation, Storage, and Communication	0.000	0.18	0.89
Trade	0.018	0.32	0.88
Finance	0.000	0.15	0.76
Real Estate and Ownership of Dwellings	0.000	0.09	0.65
Private Services	0.026	0.17	1.06
Government Services	0.007	0.08	0.59

Source: Author's calculations based on NSCB (2006).

The cost share of agriculture is highest for manufacturing, at 0.11 pesos. Meanwhile the coefficient of forward linkages of agriculture is 0.37 pesos per peso of aggregate (gross) output; compare this with the median value (across sectors) of 0.17 pesos. The coefficient is generally higher than any of the service sectors, and is exceeded only by mining (0.46 pesos) and manufacturing (0.56 pesos). Similarly the sensitivity of forward linkages is 1.03, which ranks third after manufacturing (2.88) and private services (1.06).

We also compute the coefficient of forward linkages for the sub-sectors of agriculture, using the 240-sector version of the 2000 I-O table (NSCB, 2006). We take the ratio of the coefficient of forward linkages by sub-sector to the median coefficient (0.22 pesos). The coefficient of forward linkages is highest for the following sub-sectors: sugar milling and refining (1.3), milk processing (1.4), milk processing (1.4), rice and corn milling (1.7), and paddy rice (1.9).

Local economy linkages. Production linkages at the national level are one aspect of agricultural linkages; at the local level, one may expect consumption linkages (running from increased agricultural income to higher household purchasing power) to be at work. An inkling of local level linkages is given in a study by Balisacan et al (2011a), which examine output linkages within the rural economy. Using a provincial panel, they regress log nonagricultural income per capita (and its components) against log per capita agricultural income, together with other control variables and interaction terms. They also estimate a specification that isolates infrastructure and initial conditions as explanatory variables. They find the following:

- Growth linkages between the agricultural sector and rural nonagricultural sector incomes are positive and statistically significant.
- Impact of agricultural growth is stronger on rural services growth.
- Infrastructure investments speed up growth of rural non-farm employment and income. The effect is stronger for local road networks. National road networks meanwhile appear to be more favorable for growth of the agricultural sector.

The second point above buttresses the importance of consumption linkages, as services are "nontradable" even at a local level. In general industry is only minor and stagnant share of rural income. This is consistent with the sector being tradable between urban and rural areas, hence rural households can switch to cheaper manufactured output from urban centers.

3.5. Transmission channels: Employment effects

Past studies on employment of unskilled labor. Country studies for Chile and Mexico (Lopez and Anriquez, 2007; Soloaga and Torres, 2007) apply a framework to elucidate another set of transmission channels from agriculture to poverty running through the labor market. The first channel is the bias of agriculture towards employing unskilled labor in rural areas. The second channel is the wage goods effect (taken up in Section 3.6).

To isolate the importance of the first channel, the case studies for Chile and Mexico fit a sub-national (regional) model of labor demand, with explanatory variables consisting of relative wage, agricultural GDP, nonagricultural GDP, and other controls. The econometric model is derived from a flexible form (generalized Leontieff) of the conditional cost function. Labor is categorized as skilled and unskilled, with the distinction gauged by educational attainment (i.e. those with complete compulsory ten-year schooling are skilled, and those who failed to complete are unskilled.)

The findings of the country cases studies are as follows:

- The elasticity of labor demand to agricultural output is higher for unskilled labor than for skilled. In Chile the elasticity for unskilled labor is 0.66, but only 0.43 for skilled; in Mexico the elasticities are 0.22 and 0.06, respectively (with the latter being statistically insignificant).

- The elasticity of labor demand to nonagricultural output is higher for skilled labor than for unskilled labor. In Chile the figure for unskilled labor is 0.37, while that of skilled labor is 0.67; in Mexico the respective elasticities are 0.57 and 0.88. These indicators corroborate the potential of agriculture to reduce poverty owing to its bias for unskilled labor.

Balisacan et al (2011b) applies the Lopez-Anriquez framework to Philippine data. For the labor market channel, the data set used is a regional panel for 1999-2009. Employment data is obtained from the Labor Force Survey (LFS), while regional GDP is from NSCB. A skilled worker is defined as one who has completed primary schooling. The results are unfortunately inconclusive.

Employment effects redux. We revisit an application of the Lopez-Anriquez approach to Philippine regions, using the October rounds of the quarterly Labor Force Survey (LFS). Details are found in the Annex; here we sketch the method and present the main results. Following Lopez-Anriquez, we limit the data set to a more recent period (2001 – 2009), as shifting definitions of regions (aggravating the imbalanced panel), together with unknown structural breaks or the presence of outliers, may raise complications in using extended time series. Furthermore, we simplify the formulation by distinguishing labor (skilled or unskilled) by sector of employment, i.e. agriculture or non-agricultural sectors (which can be implemented by exploiting the "primary occupation" information in the LFS). Hence an expansion in agricultural output directly affects only agricultural labor; likewise expansion of non-agricultural output directly

affects only non-agricultural labor.

Based on these modifications, we re-run the regression and translate the results into labor demand elasticities (evaluated at the sample mean). We obtain meaningful results from our runs: coefficient estimates are (with some exceptions) significant, and the resulting elasticities have theoretically consistent signs (Table 17). The bias towards unskilled labor holds, regardless of the definition of skilled labor; the difference is however larger for definition 2 (0.60 vs. 0.52) compared to definition 1 (0.58 vs. 0.53).

Table 9: Elasticities of sectoral labor demand to output and factor prices, by skill category

	Output	Skilled wage	Unskilled wage	Price of capital
Definition 1				
Skilled labor – agriculture	0.53	-0.26	0.62	0.15
Unskilled labor – agriculture	0.58	0.37	-0.29	0.06
Skilled labor – nonagriculture	0.87	-2.08	1.21	-0.52
Unskilled labor – nonagriculture	0.80	0.23	-0.56	-0.10
Definition 2				
Skilled labor – agriculture	0.52	-0.26	0.33	0.14
Unskilled labor – agriculture	0.60	0.38	-0.30	0.05
Skilled labor – nonagriculture	0.89	-1.48	1.13	-0.43
Unskilled labor – nonagriculture	0.68	0.23	-0.59	-0.11

Note: Definition 1 classifies a worker with complete secondary schooling as skilled; Definition 2 classifies a worker with complete primary schooling as skilled.
Source: Author's calculations.

However, output response of both skilled and unskilled labor demand is greater for nonagricultural employment; likewise, this holds irrespective of how skilled labor is defined. Nonetheless, the bias of output response is towards *skilled* labor, for either definition of skilled labor; in fact the disparity is larger for definition 2 (0.89 vs. 0.68) compared to definition 1 (0.87 vs. 0.80).

Human capital dynamics. Thus far we have examined linkages mostly for contemporaneous interactions. Structural transformation is however a long term process, with human capital formation playing an essential part in wealth dynamics as argued by Masson (2001). Evidence for the link from agricultural productivity to human capital was presented by Foster and Rosenzweig (1996) for the case of India. In their study, the Green Revolution (the spread of high yielding rice varieties) represented a new technology whose benefits tend to be differentially captured by more educated farmers (either because they are able to utilize the technology better, or tend to adopt the technology earlier). This raises returns to education, therefore increasing household investments in schooling.

Otsuka and Yamano (2006) summarize four long term panel studies in the Philippines, Thailand, Bangladesh, and India (Estudillo et al, 2006; Cherdchuchai and Otsuka, 2006; Nargis and Hossain, 2006; Kajisa and Palanichamy, 2006). For these studies, the link from agricultural productivity to human capital is more straightforward: the Green Revolution led to higher household purchasing power, which funded increased investments in children's education. This allowed children to later gain access to higher paying jobs outside agriculture. This case

confirms an intergenerational transmission from technological progress in agriculture to poverty reduction, albeit over the long term.

3.6. Wage goods effects

To analyze the wage goods effect, the Chile and Mexico studies cited above estimate a regression model using national time series. This regression relates real nontradable food price index to the following explanatory variables: agricultural output, nonagricultural output, other controls (including time trend). Balisacan et al (2011b) similarly examined the food price channel for the Philippine case, using a quarterly time series (1994 – 2010). The findings are as follows:

- Agricultural output has a statistically significant short run effect on real food prices in Chile; however the magnitude of the long run elasticity is small.

- In Mexico, agricultural output does not significantly affect real food prices; rather the most important determinant is the real exchange rate. Compared to the employment channel, the the food price channel appears to be of secondary importance; consistent with the earlier literature, the wage good effect can be attenuated by openness to international trade. This is not surprising as the wage goods effect hinges on the assumption that food is nontradable, at least to some degree.

- For the Philippines, the agricultural output growth reduces food CPI, with a long run elasticity of 0.44.

The link running from food cost to wages has been explored to some extent by other studies. Lasco et al (2008) measure the impact of the price of rice (accounting for nearly one-fifth of the total food basket) on agricultural wages in the Philippines. They find a positive long run elasticity between 0.78 and unity. Brooks (2002) has found that a 10 percent increase in CPI causes an 11 – 13 percent increase in the minimum wage rate. As food accounts for half of the consumption basket (http://census.gov.ph/data/technotes/notecpi_rebase.html#WEIGHTS), then agricultural output growth (or contraction) would ultimately impact on minimum wages. This in turn levers up formal sector wages; in addition, it may introduce significant delays in labor market adjustment to external shocks (Montalvo, 2006).

3.7. Recapitulation

As reviewed in the foregoing, a number of multi-sector models elucidate the mechanics of structural transformation in the course of economic development. Empirical work has substantiated some of the salient features and predictions of these models, namely:

- Measures of output, productivity, or income distribution, or poverty, are related to measures of structural change or labor market dualism;

- Agriculture affects overall output through both production and household demand linkages;

- Agriculture promotes inclusive growth through labor market effects due to direct and indirect effects, i.e. demand for unskilled labor, human capital formation, and reduced cost of wage goods.

Taken together, the main hypothesis of this paper (stated in Section 1) is generally confirmed: Agriculture is indeed a key sector for promoting pro-poor growth. It may function as a lead sector for structural transformation, both for output, but more importantly for employment. We likewise find that the rural nonfarm economy is a critical component of employment and income growth in rural areas. Gains from agricultural development would need to be translated into rural income diversification, and ultimately changes in the structure of output and employment, in order to sustain the impetus for broad-based growth.

4. ELEMENTS OF AN AGRICULTURE-LED STRATEGY FOR MORE AND BETTER JOBS

Our state-of-the-art, together with the econometric analysis, support positioning the agricultural and rural economy at the forefront, rather than periphery, of the country's strategy for quality employment generation. The elements of such an agriculture-led strategy are elaborated in this concluding Section. In the following we draw extensively from David et al (1986); Digal (2011); Habito et al (2010); and other references cited below.

The unfinished reform agenda represents a tremendous missed opportunity to promote sustained growth of agriculture.

Since the mid-1980s, an ambitious reform agenda for Philippine agriculture was laid out in the so-called "Green Book", summarized as follows:

- Institute a new land reform program;
- Remove bias against higher growth and efficiency in the rural economy;
- Strengthen economic support services to increase productivity, improve market efficiency, and expand markets;
- Protect the long term sustainability of agricultural production through conservation policy;
- Increase effectiveness of government entities involved in agricultural support services, such as by decentralized extension.

Successive administrations have embraced this agenda. The Comprehensive Agrarian Reform Program (CARP) was implemented; export taxes and various trade monopolies were dismantled; agricultural extension was decentralized; and a flexible exchange rates were introduced. The Agricultural Tariffication Law harmonized the country's agricultural trade policies with its World Trade Organization commitments. The Agriculture and Fisheries Modernization Act (AFMA) introduced market-oriented reforms, particularly in credit, while mandating massive increases in public spending for agriculture.
Nevertheless much of the reform agenda remains incomplete or riddled with implementation flaws. As noted by World Bank (2007), Philippine agriculture has been characterized not only *by* anemic growth but also weak diversification and structural transformation, particularly among the crops, owing largely to the policy mix (both budgetary and indirect market support structure) favoring traditional activities, especially rice and corn. Completing the agenda would entail the following policy directions:

The land reform program *must be completed swiftly; post-2014, the state should focus on developing a flexible and responsive market for land rights.*

After over a quarter century the land reform program is still unfinished, wreaking havoc on land markets and agricultural investment. After 2014 (the terminal date of the extended CARP), the Department of Agrarian Reform (DAR) should be reoriented as a land administration agency for enabling and overseeing land markets, particularly for land rights. It is noteworthy that in some countries with nationality restrictions on land ownership, foreign direct investments are relatively unimpeded as there is an active and credible market for long term leasehold.

A prerequisite for a flexible and responsive market for land rights is a reliable property rights system, which is far from the the case in the Philippines (LAMP Project, 2002; Llanto and Ballesteros, 2003). RA 6657, the law enacting CARP, is but one of numerous decrees, Republic Acts, and issuances governing formal land rights. In contrast, neighboring countries such as Thailand, Malaysia, and Indonesia, have a comprehensive Land Code. The land administration system is also deeply flawed. Legal and administrative reforms are essential to address these constraints, such as, among others: transfer of registration procedures from courts to the executive branch; consolidation of all land titling functions under a single agency (except perhaps ancestral domain title); consolidation of all property titles into single Certificate of Title; recognition of continuous possession by conferment of Torrens title (perhaps following a probationary issuance of "provisional title"); enactment of a national land use law; and comprehensive mapping and database of lands describing categories, land use, and property boundaries.

Liberalization initiatives should be pursued in the area of market policy and logistics. Government should rationalize its role as market regulator.

Among all agricultural products, rice remains under a government import monopoly administered as a quantitative restriction (QR), under the faulty pursuit of "food security". More conducive for food security and agribusiness investment is to turn over the marketing function (particularly quantity decisions) to the private sector. The NFA may confine itself to regulating food markets and stabilizing rice price. Similarly shipping of agricultural products is prone to high cost and inefficiencies owing to anti-cabotage and regulation by the Philippine Ports Authority (PPA) which simultaneously generates income from port regulation, raising conflict-of-interest issues. Competition in domestic shipping should be introduced; PPA must hive off port operations to other entities.

An important regulatory function of government is to ensure food safety and protection of domestic animal and plant health. Investment in certification and safety standards could even promote competitiveness particularly for exports. In the import side, government should desist from treating its import license and permit system as a *de facto* QR as demanded by influential domestic corn, pork, poultry, sugar, onion, and other producer lobbies.

Support for agricultural production should be oriented towards enhancing agricultural productivity, and comparative advantage based largely on the effective delivery of public goods and associated services such as R&D, irrigation, and other infrastructure.

In recent years public outlays for agriculture have grown dramatically; however this has been largely driven by expenditures for production support, mostly in the form of input subsidies (seed and fertilizer), together with irrigation, subsidized credit, and postharvest facilities. Given the recent food price crisis and the renewed calls for self-sufficiency, the bulk of this support has been given to rice production (60 – 70% by some estimates). However, rice is an importable crop for which the country has no comparative advantage. Under the new administration (since

2010), the regime of input subsidies has been phased out, although large outlays for commodity programs continues, with rice still commanding the largest budget owing to the insistence on food self-sufficiency.

Agricultural inputs, postharvest facilities, and production credit are all "private goods" that can be provided by the market. Rather government should focus on goods that are underprovided by the market, known as "public goods". A prominent example is R&D, which by measures such as research intensity has been underprovided. The public goods and services delivery system should in particular be geared towards a diversified agriculture, not one that is designed to perpetuate the dominance of traditional crops such as rice, corn, coconut, and sugarcane.

Irrigation is a public good which has been extensively provided by the DA in line with its rice self-sufficiency target. However such a target is far too aggressive; together with more selective choice of rehabilitation projects, a number of implementation reforms need to be adopted (already stated in the Green Book), namely: irrigation development must from from an engineering paradigm, to a participatory paradigm based on an interactive approach with farmers covering design, construction, operation, and maintenance of the facilities. Irrigation services must be oriented towards multi-commodity use, i.e. supplemental watering of diversified cropping systems, small run-of-the-river schemes, impounding systems, and gravity communal facilities for up to 200 ha.

Agricultural development transcends productivity enhancement at the level of primary production, encompassing the agribusiness value chain and rural services, and based on comparative advantage.

The icon of agricultural development is the Green Revolution, which was based on the dissemination of genetically improved staple crops. Much gains can be realized from such farm level improvements. However sustained growth combined with rising labor productivity (translating to more and better jobs) will require entails transformation of the entire value chain, towards greater competitiveness, a wider variety of goods produced, and broader dispersion of downstream processing activities in the countryside. Crucial to value chain expansion is logistics development to encourage storage (for intertemporal arbitrage), and transport (for geographic arbitrage); equally important is a utilities system that provides electricity and water on a reliable and cost-effective basis.

In addition to agro-processing is services, for which one promising product with a large market is tourism. Nature-based and to some extent cultural tourism are market segments for which many rural-based attractions are highly competitive. Tourism is well-positioned as a growth sector with visitor arrivals growing by 17% in the past year (www.tourism.gov.ph). The Tourism Master Plan identifies a number of strategies to realize the sector's potential, namely: i) improving market access and connectivity; ii) developing and marketing competitive tourist destinations and products; and iii) Improving tourism institutional, governance and human resource capacities.

As argued under the NSE, such a transition entails both soft and hard infrastructure support. Physical infrastructure provision would in some cases entail private-public partnerships, with the public sector providing the capital while the government provides access rights, attenuates risk, and regulates against monopoly power. Soft infrastructure is also essential given the need to organize agribusiness clusters (to realize economies of scale and scope), enforce contracts, provide a legal framework, and impose standards, as well as market-matching and other

business services.

To conclude: our policy prescriptions are far from original; instead these have been formulated based on review and synthesis of past work, under the rubric of an "unfinished reform agenda", viewed through the lens of structural transformation of output and employment. The fact that it is unfinished suggests that there are formidable obstacles – mostly political – in the way of its completion. Nevertheless, past administrations have managed to push key reforms despite massive political opposition, hence there is good reason to be (cautiously) optimistic.

ANNEX

Agriculture and non-agriculture growth interaction

Given the panel format we apply both fixed and random effects regression. Due to changing definitions of regions the resulting panel is unbalanced. Before applying Granger causality analysis to output we first check for stationarity of the log and log difference of gross value added (agriculture and nonagriculture). We apply the Im-Pesharan-Shin unit root test, which is applicable to unbalanced panels. For levels (in logs), we fail to reject non-stationarity only for agriculture gross value added. Meanwhile for first differences, non-stationarity is rejected for both agricultural and nonagricultural gross value added (Table A. 1).

Table A. 1: Results of an Im-Pesharan-Shin unit root test (Ho: series is non-stationary)

Variable (in logs)	test statistic	p-value
Gross value added – agriculture	-0.2259	0.4106
Gross value added – nonagriculture	-2.4129	0.0079
Gross value added – agriculture (first difference)	-84.6882	0.0000
Gross value added – nonagriculture (first difference)	-1300.0000	0.0000

Source: Author's calculations.

Hence we apply the Granger causality analysis to the first differences, consistent with Christiansen et al (2011). Results for a fixed effects regression are displayed in Table 9. The first two columns present results for lagged nonagricultural output on the right hand side; the next two columns include a lagged agricultural output term. The findings are similar for the random effects regression (Table A. 2), suggesting a degree of robustness in estimates. Note that the agricultural output term is positive and significant; the Wald test for zero coefficient of agricultural rejects the null at 5% level of significance. Hence growth in agricultural output Granger-causes growth in nonagricultural output.

Table A. 2: Estimates for regression on nonagricultural output (in log difference), fixed effects

	Lagged nonagricultural output (GVN_{-1})		With lagged agricultural output (GVA_{-1})	
R^2	0.11		0.12	
	Coefficient	t-value	Coefficient	t-value
GVN_{-1}	-0.2067***	-3.47	-0.0571***	-2.99
GVA_{-1}	NA	NA	0.0491**	2.01
YEAR	-0.0023***	-4.90	-0.0024***	-4.94
CONSTANT	4.8155***	5.03	4.8326***	5.06

Notes:
1. *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level.
2. Test of linear restriction: coeff(GVA_{-1})= 0: Pr(F> Fc) = 0.0451

Source: Author's calculations.

Table 10: Estimates for regression on lagged nonagricultural output, random effects

	Lagged nonagricultural output, difference in logs (GVN_{-1})		With lagged agricultural output, difference in logs (GVA_{-1})	
	Coefficient	t-value	Coefficient	t-value
GVN_{-1}	-0.2068***	-3.55	-0.0554***	-2.98
GVA_{-1}	NA	NA	0.0467**	1.96
YEAR	-0.0023***	-5.13	-0.0023***	-5.16
CONSTANT	4.7868***	5.26	4.8326***	5.06

Notes:
1. *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level.
2. Test of linear restriction: coeff(GVA_{-1})= 0: Pr(F> Fc) = 0.0495

Source: Author's calculations.

Employment of labor by skill category.

Balisacan et al (2011b) applies the Lopez-Anriquez framework to Philippine data. For the labor market channel, the data set used is a regional panel for 1999-2009. Employment data is obtained from the Labor Force Survey (LFS); alternative definitions of employment were used, i.e. number of employed workers, average hours worked, and total hours worked. GDP data is obtained from NSCB. A skilled worker is defined as one who has completed primary schooling. Skilled and unskilled wage is proxied by regional average monthly earnings from employment. To correct for potential endogeneity the earnings variable is instrumented in the standard manner (although estimates obtained are similar if the wage proxy were directly used).

The results are unfortunately inconclusive. Wage elasticity of labor demand is either not statistically significant, or in some cases significant and of negative sign. On the other hand, the result from the food price channel was more encouraging. Using a quarterly time series (1994 – 2010), the authors found that agricultural output reduces food CPI, with a long run elasticity of 0.44. The knock-on effect with respect to wages was not measured (nor was this done in Lopez-Anriquez); Lasco et al (2008) measure the relationship between *agricultural* wages and *rice price* and find a positive long run elasticity between 0.78 and unity. However other interesting effects of food prices in general on nonagricultural wages and employment by sector have yet to be empirically determined.

The authors attempt to account for the differences between their findings and those from the Chilean case study. For food CPI the contrasting results are likely due to the degree by which the Philippine food market tends to be closed to international trade (i.e. high protection) relative to that of Chile. For the labor demand estimation, poor results may be partly due to the quality of the regional GDP data, as well as possible aggregation issues that vitiate the application of a regression model derived from firm-specific profit maximization.

We shall revisit an application of the Lopez-Anriquez approach with appropriate modifications. The original Lopez-Anriquez formulation, as expanded by Balisacan et al (2011b), is as follows: let *C* denote the multi-output cost function for agricultural and and nonagricultural output, respectively denoted q_a, q_n. Let the indices *i*, *j* = *s*, *u*, *k*, respectively denote skilled labor, unskilled labor, and capital, with factor prices w_i and factor demands L_i. The time trend (a proxy for technical progress) is denoted *t*, while *b*, *c*, *d*, and *e* are constant terms. The cost function is specified as follows:

$$C = q_a \sum_i \sum_j b_{ij} \left(w_i w_j \right)^{0.5} + q_n \sum_i \sum_j c_{ij} \left(w_i w_j \right)^{0.5} + q_a q_n \sum_i d_i w_i + q_a^2 \sum_i e_i w_i + q_n^2 \sum_i f_i w_i + t q_a \sum_i b_i w_i + t q_n \sum_j c_i w_i \quad 1)$$

The conditional labor demand functions are derived via Shepherd's Lemma from the derivatives of the cost function:

$$L_s = \frac{\partial C}{\partial w_s} = q_a \sum_j b_{sj} \left(w_j / w_s \right)^{0.5} + q_n \sum_j c_{sj} \left(w_j / w_s \right)^{0.5} + q_a q_n d_s + q_a^2 e_s + q_n^2 f_s \quad 2)$$

$$L_s = \frac{\partial C}{\partial w_u} = q_a \sum_j b_{uj} \left(w_j / w_u \right)^{0.5} + q_n \sum_j c_{uj} \left(w_j / w_u \right)^{0.5} + q_a q_n d_u + q_a^2 e_u + q_n^2 f_u \quad 3)$$

$$L_k = \frac{\partial C}{\partial w_k} = q_a \sum_j b_{kj} \left(w_j / w_k \right)^{0.5} + q_n \sum_j c_{kj} \left(w_j / w_k \right)^{0.5} + q_a q_n d_k + q_a^2 e_k + q_n^2 f_k \quad 4)$$

The elasticities with respect to output are as follows:

$$\frac{\partial L_s}{q_a} \frac{q_a}{L_s} = \frac{q_a}{L_s} \left[\sum_j b_{sj} \left(w_j / w_s \right)^{0.5} + t b_s + d_s q_n + 2 c_s q_a \right]$$

$$\frac{\partial L_s}{\partial q_n} \frac{q_n}{L_s} = \frac{q_n}{L_s} \left[\sum_j c_{sj} \left(w_j / w_s \right)^{0.5} + t c_s + d_s q_a + 2 f_s q_n \right]$$

$$\frac{\partial L_u}{\partial q_a} \frac{q_a}{L_u} = \frac{q_a}{L_u} \left[\sum_j b_{uj} \left(w_j / w_s \right)^{0.5} + t b_u + d_u q_n + 2 c_u q_a \right]$$

$$\frac{\partial L_u}{\partial q_n} \frac{q_n}{L_u} = \frac{q_n}{L_s} \left[\sum_j c_{uj} \left(w_j / w_s \right)^{0.5} + t c_u + d_u q_a + 2 f_u q_n \right]$$

Meanwhile the elasticities with respect to factor prices are as follows:

$$\frac{\partial L_s}{\partial w_s} \frac{w_s}{L_s} = \frac{-0.5}{L_s} \left[q_a \sum_j b_{sj} \left(w_j / w_s \right)^{0.5} + q_n \sum_j c_{sj} \left(w_j / w_s \right)^{0.5} \right]$$

$$\frac{\partial L_s}{\partial w_u} \frac{w_u}{L_s} = \frac{0.5}{L_s} \left[q_a b_{su} \left(w_u / w_s \right)^{0.5} + q_n c_{su} \left(w_j / w_s \right)^{0.5} \right]$$

$$\frac{\partial L_u}{\partial w_u} \frac{w_u}{L_u} = \frac{-0.5}{L_s} \left[q_a \sum_j b_{uj} \left(w_j / w_u \right)^{0.5} + q_n \sum_j c_{uj} \left(w_j / w_u \right)^{0.5} \right]$$

$$\frac{\partial L_u}{\partial w_s} \frac{w_s}{L_u} = \frac{0.5}{L_u} \left[q_a b_{us} \left(w_s / w_u \right)^{0.5} + q_n c_{us} \left(w_s / w_u \right)^{0.5} \right]$$

The symmetry condition requires $b_{ij} = b_{ji}, c_{ij} = c_{ji}$. Lopez-Anriquez omit factor demand equation for capital; hence symmetry entails $b_{su} = b_{us}, c_{su} = c_{us}$. Note that Lopez-Anriquez impose $e_i = f_i = 0$, whereas Balisacan et al (2011b) incorporate it in the estimation; we follow the latter course. Estimation applies seemingly unrelated regression, which is common in systems of equations with cross-equation restrictions.

We use the October rounds of the quarterly Labor Force Survey (LFS) to obtain regional averages for employment and wages by skill category (skilled and unskilled). We apply two alternative definitions of skilled labor: a skilled worker under the first definition is one who has completed high school, and under the second definition is one who has completed primary school. The second definition is one adopted by Lopez-Anriquez and Balisacan et al (2011b). Note that we obtain the respective shares in employment from the LFS, and apply these shares to the published regional employment data of the NSCB, which is also our source for regional GDP. The factor price of capital is proxied by the implicit deflator of national capital stock based on the national income accounts (with 1985 as base year). Following Lopez-Anriquez, we limit the data set to a more recent period (2001 – 2009). Ordinarily a long time series is preferred, as in Baliscan et al (2011b); however shifting definitions of regions (aggravating the imbalanced panel), together with unknown structural breaks or the presence of outliers, may raise complications in using extended time series.

In addition, Balisacan et al (2011b) point out a critical problem with equation 2), namely that application of duality theory based on competitive profit maximization may be prone to aggregation issues at the level of the region. We highlight one specific difficulty, which is the multi-output specification involving skilled and unskilled labor. Estimating 2) essentially maps variations in labor use by skill category to variations in agricultural or nonagricultural output, irrespective of whether the labor was deployed primarily in a specific sector (agriculture or nonagriculture).

This can be addressed by simplifying to a single output case, which can be implemented by exploiting the "primary occupation" information in the Labor Force Survey. The single output generalized Leontieff cost function can be specified separately for agriculture and nonagriculture, C_a, C_n; these are, together with the labor demands:

$$C_a = q_a \sum_i \sum_j b_{ij} \left(w_j w_i \right) + t q_a \sum_i b_i w_i$$

$$C_n = q_n \sum_i \sum_j c_{ij} \left(w_j w_i \right) + t q_n \sum_i c_i w_i$$

$$L_{as} = q_a \sum_j b_{sj} \left(w_j / w_s \right)^{0.5} + t q_a b_s \qquad 5)$$

$$L_{au} = q_a \sum_j b_{uj} \left(w_j / w_u \right)^{0.5} + t q_a b_u \quad 6)$$

$$L_{ns} = q_n \sum_j c_{sj} \left(w_j / w_s \right)^{0.5} + t q_n c_s \quad 7)$$

$$L_{nu} = q_n \sum_j c_{uj} \left(w_j / w_u \right)^{0.5} + t q_n c_u \quad 8)$$

Likewise the symmetry restriction in 6) and 7) as well in 8) and 9) are respectively, $b_{us} = b_{su}, c_{us} = c_{su}$. We seek to estimate 6) to 9) as an alternative to the original formulations 3) and 4). The elasticities with respect to output are as follows:

$$\frac{\partial L_{as}}{\partial q_a} \frac{q_a}{L_{as}} = \frac{q_a}{L_{as}} \sum_j b_{sj} \left(w_j / w_s \right)^{0.5} + b_s t$$

$$\frac{\partial L_{au}}{\partial q_a} \frac{q_a}{L_{au}} = \frac{q_a}{L_{au}} \sum_j b_{uj} \left(w_j / w_u \right)^{0.5} + b_u t$$

$$\frac{\partial L_{ns}}{\partial q_n} \frac{q_n}{L_{ns}} = \frac{q_n}{L_{ns}} \sum_j c_{sj} \left(w_j / w_s \right)^{0.5} + c_s t$$

$$\frac{\partial L_{nu}}{\partial q_n} \frac{q_n}{L_{nu}} = \frac{q_n}{L_{nu}} \sum_j c_{uj} \left(w_j / w_u \right)^{0.5} + c_u t$$

The elasticities with respect to factor prices are as follows:

$$\frac{\partial L_{as}}{\partial w_s} \frac{\partial w_s}{\partial L_{as}} = \frac{-0.5}{L_{as}} q_a \sum_j b_{sj} \left(w_j / w_s \right)^{0.5}$$

$$\frac{\partial L_{as}}{\partial w_u} \frac{\partial w_u}{\partial L_{as}} = \frac{0.5}{L_{as}} q_a b_{su} \left(w_u / w_s \right)^{0.5}$$

$$\frac{\partial L_{as}}{\partial w_k} \frac{\partial w_k}{\partial L_{as}} = \frac{0.5}{L_{as}} q_a b_{sk} \left(w_k / w_s \right)^{0.5}$$

$$\frac{\partial L_{au}}{\partial w_s} \frac{\partial w_s}{\partial L_{au}} = \frac{0.5}{L_{au}} q_a b_{us} \left(w_s / w_u \right)^{0.5}$$

$$\frac{\partial L_{au}}{\partial w_u} \frac{\partial w_u}{\partial L_{au}} = \frac{-0.5}{L_{au}} q_a \sum_j b_{uj} \left(w_j / w_u \right)^{0.5}$$

$$\frac{\partial L_{au}}{\partial w_k} \frac{\partial w_k}{\partial L_{au}} = \frac{0.5}{L_{au}} q_a b_{uk} \left(w_k / w_u \right)^{0.5}$$

$$\frac{\partial L_{ns}}{\partial w_s} \frac{\partial w_s}{\partial L_{ns}} = \frac{-0.5}{L_{ns}} q_n \sum_j c_{sj} \left(w_j / w_s \right)^{0.5}$$

$$\frac{\partial L_{ns}}{\partial w_u}\frac{\partial w_u}{\partial L_{ns}} = \frac{0.5}{L_{ns}} q_n c_{su} \left(w_u / w_s\right)^{0.5}$$

$$\frac{\partial L_{ns}}{\partial w_k}\frac{\partial w_k}{\partial L_{ns}} = \frac{0.5}{L_{ns}} q_n c_{sk} \left(w_k / w_s\right)^{0.5}$$

$$\frac{\partial L_{nu}}{\partial w_s}\frac{\partial w_s}{\partial L_{nu}} = \frac{0.5}{L_{nu}} q_n c_{us} \left(w_s / w_u\right)^{0.5}$$

$$\frac{\partial L_{bu}}{\partial w_u}\frac{\partial w_u}{\partial L_{nu}} = \frac{-0.5}{L_{nu}} q_n \sum_j c_{uj} \left(w_j / w_u\right)^{0.5}$$

$$\frac{\partial L_{nu}}{\partial w_k}\frac{\partial w_k}{\partial L_{nu}} = \frac{0.5}{L_{nu}} q_n c_{uk} \left(w_k / w_u\right)^{0.5}$$

Results of estimating 3) and 4) are shown respectively in Table A. 3 and Table A. 4. Each table presents estimates corresponding to alternative definitions of skilled labor. Under definition 1, statistically significant coefficients (at 5% level) pertain to the relative unskilled wage (interacted with agricultural output and nonagricultural output), nonagricultural output, nonagricultural output (interacted with agricultural output), and the squared agricultural output. A similar set of coefficients are statistically significant for the alternative definition of skilled labor (nonagricultural output is no longer significant). The coefficient values however tend to change with the adjustment in the definition of skilled worker.

Table A. 3: Estimates of regression on skilled labor employment

Variable	Definition 1		Definition 2	
	Coefficient	z-value	Coefficient	z-value
$(w_s/w_s)q_a$	-0.1287	-1.06	0.0043	0.35
$(w_u/w_s)q_a$	0.0432***	5.22	0.0449***	6.41
$(w_k/w_s)q_a$	-0.0454	-0.39	-0.1802	-1.57
$(w_s/w_s)q_n$	0.0060**	1.95	0.0042	1.37
$(w_u/w_s)q_n$	-0.0069***	-3.05	-0.0084***	-4.5
$(w_k/w_s)q_n$	0.0033	0.12	0.0344	1.18
tq_a	-2.74 x 10^{-6}	-0.01	-0.0002	-0.61
tq_n	-0.0002	-2.24	-0.0002*	-1.83
$q_a q_n$	(3.44 x 10^{-8})***	4.50	(3.89 x 10^{-8})***	4.54
q_a^2	(-1.29 x 10^{-7})***	-5.28	(-1.5 x 10^{-7})***	-5.51
q_n^2	1.59 x 10^{-10}	0.12	-4.71 x 10^{-10}	-0.31
constant	100.4562**	2.29	167.6839***	3.48

Notes:
1. *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level.
2. Definition 1 classifies a worker with complete secondary schooling as skilled; Definition 2 classifies a worker with complete primary schooling as skilled.

Source: Author's calculations.

Table A. 4: Estimates of regression on unskilled labor employment

Variable	Definition 1		Definition 2	
	Coefficient	z-value	Coefficient	z-value
$(w_s/w_u)q_a$	0.0432***	5.22	0.0449***	6.41
$(w_u/w_u)q_a$	0.0413	0.32	-0.1873*	-1.91
$(w_k/w_u)q_a$	-0.3747***	-4.03	-0.2493***	-3.59
$(w_s/w_u)q_n$	-0.0068***	-3.05	-0.0084***	-4.5
$(w_u/w_u)q_n$	-0.0032	-0.97	0.0024	0.97
$(w_k/w_u)q_n$	0.1000***	4.28	0.0709***	4.07
tq_a	0.0003	0.86	0.0004	1.44
tq_n	-0.0003***	-3.42	-0.0003***	-4.02
$q_a q_n$	9.00×10^{-9}	1.06	$(3.95 \times 10^{-9}$	0.57
q_a^2	(-8.00×10^{-8})***	-2.99	(-5.06×10^{-8})**	-2.32
q_n^2	(3.43×10^{-9})**	2.24	(3.60×10^{-9})***	2.93
constant	441.4177***	9.42	373.1585***	9.88

Notes:
1. *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level.
2. Definition 1 classifies a worker with complete secondary schooling as skilled; Definition 2 classifies a worker with complete primary schooling as skilled.

Source: Author's calculations.

Using coefficient estimates we obtain the elasticities of labor demand (Table A. 5). Own price elasticities are negative, as expected. The positive elasticity of unskilled wage (for skilled labor) and of skilled wage (for unskilled labor) imply substitution between skilled and unskilled labor. However the negative elasticities with respect to the price of capital imply complement-arity between capital and labor (whether skilled or unskilled). The output elasticities are positive. However labor demand elasticity is greater for nonagricultural output, whether for skilled or unskilled labor; moreover for agricultural output, elasticity of labor demand is greater for skilled labor compared to unskilled labor. This contrasts with the findings of Lopez-Anriquez in which labor demand elasticity for unskilled labor is greater for agricultural output, whereas skilled labor demand elasticity is greater for nonagricultural output.

Table A. 5: Elasticities of labor demand to output and factor prices, by skill category

	Output, agriculture	Output, nonagriculture	Skilled wage	Unskilled wage	Price of capital
Skilled labor (Def. 1)	0.3140	0.5515	-0.5773	0.4639	-0.1165
Unskilled labor (Def. 1)	0.2022	0.3886	0.7715	-0.4298	-0.1698
Skilled labor (Def. 2)	0.3270	0.5039	-0.5772	0.3009	-0.1789
Unskilled labor (Def. 2)	0.1637	0.3825	0.8333	-0.3735	-0.0752

Source: Authors' calculations based on LFS data and Tables 8 and 9.

We therefore run an alternative regression using incorporating the distinction of employment by sector. Such distinction is meaningful as seen in the breakdown of employment by skill category in each sector (Table A. 6). Under definition 1 (secondary school completion), an overwhelming majority of agricultural labor is unskilled in most regions (lower majorities are observed in Ilocos and Central Luzon). On the other hand a moderate to large majority of employment in

nonagriculture consists of skilled workers. Under definition 2 (primary school completion), shares of unskilled in agricultural employment decline but are still dominant, exceeding 3 out of 5 in almost all regions (Table A. 7). Similarly the shares of skilled in total employed rise for the nonagricultural sector.

Table A. 6: Estimates of regression on labor demand by sector and skill category (Definition 1)

Variable	Skilled labor		Unskilled labor	
	Coefficient	z-value	Coefficient	z-value
Agriculture				
$(w_s/w_s)q_a$	-0.0033***	-3.06	0.0058***	4.60
$(w_u/w_s)q_a$	0.0058***	4.60	-0.0030*	-1.77
$(w_k/w_s)q_a$	0.0094**	1.98	0.0086	1.16
tq_a	3.18 x 10^{-5}	-1.49	-0.0003***	-4.42
constant	96.7605***	9.43	366.5469***	16.06
Nonagriculture				
$(w_s/w_u)q_n$	0.0062***	14.75	0.0008***	2.25
$(w_u/w_u)q_n$	0.0008***	2.25	0.0020***	4.81
$(w_k/w_u)q_n$	-0.0253***	-6.82	-0.0032***	-1.84
tq_n	-0.0002***	-6.83	-0.0001***	-8.78
constant	87.0603***	3.52	102.0556***	6.30

Notes:
1. *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level.
2. Definition 1 classifies a worker with complete secondary schooling as skilled; Definition 2 classifies a worker with complete primary schooling as skilled.

Source: Author's calculations.

Table A. 7: Estimates of regression on labor demand by sector and skill category (Definition 2)

Variable	Skilled labor		Unskilled labor	
	Coefficient	z-value	Coefficient	z-value
Agriculture				
$(w_s/w_s)q_a$	-0.0023*	-1.91	0.0050***	3.75
$(w_u/w_s)q_a$	0.0050***	3.75	-0.0025	-1.47
$(w_k/w_s)q_a$	0.0138**	2.48	0.0061	0.93
tq_a	-0.0001***	-2.2	-0.0003***	-4.29
constant	170.0771***	13.03	292.6184***	14.09
Nonagriculture				
$(w_s/w_u)q_n$	0.0073***	16.61	0.0005*	1.78
$(w_u/w_u)q_n$	0.0005*	1.78	0.0014***	4.32
$(w_k/w_u)q_n$	-0.0252***	-6.45	-0.0023*	-1.69
tq_n	-0.0002***	-7.39	-0.0001***	-8.51
constant	123.5859***	4.46	66.8964***	5.29

Notes:
1. *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level.
2. Definition 1 classifies a worker with complete secondary schooling as skilled; Definition 2 classifies a worker with complete primary schooling as skilled.

Source: Author's calculations.

Lastly we translate the coefficients (and sample mean values) to elasticities (Table A. 6). Compared to the previous elasticity calculation, the elasticity of unskilled labor demand with respect to output is now greater than that of unskilled labor, in the case of the agricultural sector (recall that no sectoral employment distinction was incorporated in the earlier set of elasticities). The bias towards unskilled labor holds, regardless of the definition of skilled labor; the difference is however larger for definition 2 (0.60 vs. 0.52) compared to definition 1 (0.58 vs. 0.53).

However, output response of both skilled and unskilled labor demand is greater for nonagricultural employment; likewise, this holds irrespective of how skilled labor is defined. Nevertheless, unlike in the agricultural sector, the bias of output response is towards *skilled* labor, for either definition of skilled labor; in fact the disparity is larger for definition 2 (0.89 vs. 0.68) compared to definition 1 (0.87 vs. 0.80).

As for the factor prices, own-price elasticities are negative, while cross price elasticities in the case of labor are positive, implying substitution between skilled and unskilled labor. However in the agricultural sector the elasticities with respect to the price of capital are positive, denoting substitution effects, whereas in the nonagricultural sector these elasticities are negative, denoting complementarity between capital and labor.

Table A. 8: Elasticities of sectoral labor demand to output and factor prices, by skill category

	Output	Skilled wage	Unskilled wage	Price of capital
Definition 1				
Skilled labor – agriculture	0.53	-0.26	0.62	0.15
Unskilled labor – agriculture	0.58	0.37	-0.29	0.06
Skilled labor – nonagriculture	0.87	-2.08	1.21	-0.52
Unskilled labor – nonagriculture	0.80	0.23	-0.56	-0.10
Definition 2				
Skilled labor – agriculture	0.52	-0.26	0.33	0.14
Unskilled labor – agriculture	0.60	0.38	-0.30	0.05
Skilled labor – nonagriculture	0.89	-1.48	1.13	-0.43
Unskilled labor – nonagriculture	0.68	0.23	-0.59	-0.11

Note: Definition 1 classifies a worker with complete secondary schooling as skilled; Definition 2 classifies a worker with complete primary schooling as skilled.

Source: Author's calculations.

REFERENCES

Balisacan, A., D. Mapa, N. Fuwa, C. Santos, S. Piza, 2011a. *Addressing Infrastructure Constraints to the Development of the Rural Non-farm Sector Implications for Poverty and Rural Development*. Report submitted to World Bank and Australian Agency for International Development. Asia Pacific Policy Center, Quezon City.

Balisacan, A., N. Fuwa, D. Mapa, S. Piza, M. Sombilla, and C. Santos, 2011b. *Inclusive Agribusiness Growth in the Philippines: The Role of Direct and Indirect Channels with a Focus on the Labor Market*. Report submitted to World Bank . Asia Pacific Policy Center, Quezon City.

Briones, R., 2006. Employment Generation for the Rural Poor in Asia: Perspectives, Patterns, and Policies. *Asian Development Review* 23(1):89-118.

Bourguignon, F. and C. Morrisson, 1998. Inequality and Development: The Role of Dualism. *Journal of Development Economics* 57(2): 233-257.

Brooks, R., 2002. Why is unemployment high in the Philippines? IMF Working Paper 02/23. International Monetary Fund, Washington, D.C.

Bravo-Ortega, C., & Lederman, D., 2005. Agriculture and national welfare around the world: causality and heterogeneity since 1960. Policy Research Working Paper 3499. Washington, DC: World Bank.

Chanda, A., and C-J. Dalgaard, 2008. Dual economies and international total factor productivity differences: channelling the impact from institutions, trade, and geography. *Economica* 75(300):629 – 661.

Cherdchuchai, S., Otsuka, K., 2006. Rural income dynamics and poverty reduction in Thai villages from 1987 to 2004. Agricultural Economics 35 (Suppl): 409–423.

Christiaensen, L, L. Demery, and J. Kuhl. The (evolving) role of agriculture in poverty reduction—An empirical perspective. Journal of Development Economics 96(2): 239 – 254.

David, C, C. Habito, W. Cruz, S. Halos, F. Adriano, M. Lamberte, L. Adriano, F. Lantican, C. Arboleda, M. Lantin, E. Bautista, M. Mangahas, F. Bernardo, E. Ponce, L. Cabanilla, A. Quisumbing, C. Cruz, A. Rola, W. David, and Z. Toquero, 1996. Agenda for Action for the Philippine Rural Sector. PIDS, Makati.

Davis, B., P. Winters, G. Carletto, K. Covarrubias, E. Quinones, A. Zessa, K. Stamoulis, C. Azzarri, and S. Digiuseppe, 2010. A cross country comparison of rural income generating activities. *World Development* 38(1): 48 – 63.

Digal, L., 2011. Developing Public Private Partnership in the Philippines' Agribusiness Sector: Agribusiness Industry Clusters. World Bank.

Estudillo, J. P., Sawada, Y., Otsuka, K., 2006. The green revolution, development of labor markets, and poverty reduction in the rural Philippines, 1985-2004. Agricultural Economics 35 (Suppl): 399–407.

Fields, G.S., 2011. Labor market analysis for developing countries. *Labour Economics* 18(Supplement 1): S16 – S22.

Foster, A., and M. Rosensweig, 1996. Technical change and human-capital returns and investments: evidence from the Green Revolution. *American Economic Review* 86(4): 931- 53.

Fuwa, N., A. Balisacan, and F. Bresciani, 2011. In search of a strategy for making growth more pro-poor in the Philippines. Discussion Paper No. 2011-10. School of Economics, University of the Philippines, Diliman, Q.C.

Gollin, D., S. Parente, R. Rogerson (2002). The role of agriculture in development. *American Economic Review* 92(2):160-164.

Habito, C., R. Clarete, B. de la Pena, D. Israel, and E. Ponce, 2010. Fostering our farms, fisheries, and food: Technical Assistance for the formulation of the successor Agriculture and Fisheries Modernization Plan (AFMP) of the Department of Agriculture. World Bank.

Haggblade, S., P. Hazell, and T. Reardon, 2010. The Rural Non-farm Economy: Prospects for Growth and Poverty Reduction. *World Development* 38(10): 1429–1441.

Haggblade, S., Hazell, P. B. R., & Dorosh, P. A., 2007. Sectoral growth linkages between agriculture and the rural non-farm economy. S. Haggblade, P. Hazell, and T. Reardon, eds. *Transforming the rural nonfarm economy: Opportunities and threats in the developing world* (pp. 141–182). Baltimore: Johns Hopkins University Press

Hall, Robert E., Jones, Charles I., 1999. Why do some countries produce so much more output? *Quarterly Journal of Economics* 114 (1) 83–116.

Harris, J., and M. Todaro, 1970. Migration, unemployment, and development: a two-sector analysis. *American Economic Review* 60(1):126-142.

Johnston, B., and J. Mellor (1961). The role of agriculture in economic development. *American Economic Review* 51(4):566-593.

Jorgenson, D. 1967. Surplus agricultural labor and the development of dual economies. *Oxford Economic Papers* 19(3):288-322

Kajisa, K., Palanichamy, V., 2006. Changing mechanisms of income dynamics over the last three decades in Tamil Nadu, India. Agricultural Economics 35 (Suppl): 437–448.

Lanjouw, J., and P. Lanjouw, 2001. The rural non-farm sector: issues and evidence from developing countries. *Agricultural Economics* 26(1):1-23.

LAMP [Land Administration and Management Project], 2002. Policy Studies Integration Report.

Lasco, C., R. Myers, R. Bersten, 2008. Dynamics of rice prices and agricultural wages in the Philippines. *Agricultural Economics* 38:339-348.

Lewis, A. (1954). Economic development with unlimited supplies of labor. *Manchester School of Economic and Social Studies* 22(2):139–91.
Llanto, G., and M. Ballesteros, 2003. Land issues in poverty reduction strategies and the development agenda: Philippines. Discussion Paper Series No. 2003-03. PIDS, Makati City.

Loayza, N., and C. Raddatz, 2010. The composition of growth matters for poverty alleviation. *Journal of Development Economics* 93(1):137-151.

Lopez, R., and G. Anriquez, 2007. Chile. In: Beyond Food Production: *The Role of Agriculture in Poverty Reduction*. F. Bresciani and A. Valdes, eds. FAO and Edward Elgar, Cheltenham, UK, 57 – 82.

Masson, P., 2001. Migration, human capital, and poverty in a dual-economy model of a developing country. IMF Working Paper 01-128. Washington, D.C.: International Monetary Fund.

Mincer, J., 1958. Human capital and personal income distribution. *Journal of Political Economy* 64(4):281 – 302.

Montalvo, J., 2006. Regional evolutions in labor markets in the Philippines: a dynamic approach. Journal of Asian Economics 17(3): 448 – 477.

Nargis, N.. Hossain, M.. 2006. Income dynamics and pathway out of poverty in Bangladesh: 1988-2004. Agricultural Economics 35 (Suppl): 425–435.

National Statistical Coordination Board [NSCB], 2006. 2000 Input-Output Accounts of the Philippines. NSCB, Makati City.

Ravallion, M., and G. Datt, 1996. How important to India's poor is the sectoral composition of economic growth? *World Bank Economic Review* 10(1):1-25.

Ranis, G., and J. Fei, 1961. A theory of economic development. *American Economic Review* 51(4):533–65.

Rauch, J., 1993. Economic development, urban underemployment, and income inequality. *The Canadian Journal of Economics* 26(4):901-918.

Ravallion, M., and S. Chen, 2007. China's (uneven) progress against poverty. *Journal of Development Economics* 82(1):1042.

Reyes, C., A. Tabuga, C. Mina, R. Asis, and M.B. Datu, 2010. Chronic and Transient Poverty. Discussion Paper Series No. 2010-30 (Revised). PIDS, Makati.

Soloaga, I., and M. Torres, 2007. Mexico. In: *Beyond Food Production: The Role of Agriculture in Poverty Reduction*. F. Bresciani and A. Valdes, eds. FAO and Edward Elgar, Cheltenham, UK, 83 – 108.

Suryahadi, A., D. Suryadarma, S. Sumarto, 2009. The effects of location and sectoral components of economic growth on poverty: evidence from Indonesia. *Journal of Development Economics* 89 (): 109–117

Temple, J. and L. Wossman, 2006. Dualism and cross-country growth regressions. *Journal of Economic Growth* 11(3):187-228.

Tiffin, R., and X. Irz, 2006. Is agriculture the engine of growth? *Agricultural Economics* 35(1):79-89.

Timmer, C-P., 2002. Agriculture and Economic Growth. In: Bruce Gardner and Gordon Rausser, eds. *Handbook of Agricultural Economics*, Vol. IIA. Amsterdam: North-Holland, 1487-1546.

Tolentino, V.B., C. David, A. Balisacan, and P. Intal, 2001. Strategic actions to rapidly ensure food security and rural growth in the Philippines. Yellow Paper II: Beyond EDSA: The Post-Erap Reform Agenda.

Virola, R., 2011. 2009 official poverty statistics. Presentation for the National Statistical Coordination Board Press Conference on the 2009 Official Poverty Statistics, 8 February 2011, NSCB, Makati.

Vollrath, D., 2009. How important are dual economy effects for productivity? *Journal of Development Economics* 88(2):325-334.